

Semi-Active Suspension Control Using “Fast” Model-Predictive Techniques

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Abstract - The problem considered in this paper is the design and analysis of a control strategy, for semi-active suspensions in road vehicles, based on model-predictive control (MPC) techniques. The optimal control law we compute using predictive techniques, aims to optimize the suspension performances by minimizing a quadratic cost function, while ensuring that the magnitude of the forces generated by the control law satisfies the physical constraints of passive damping. The online computation difficulties related to the predictive-control law are overcome by means of a “fast” implementation of the MPC algorithm. A performance comparison with well-established semi-active control strategies, such as Sky-Hook control and clipped control is presented. The achievable performance improvements of the proposed design procedure over Sky-Hook and clipped control laws are shown by means of simulation results obtained using a nonlinear half car model which proved to give an accurate description of the overall vertical dynamics of a vehicle equipped with continuous damping suspension systems.